

Quality of Vinegar Made from Coconut Water and Fresh Toddy Added with Mother Liquor

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Abstract

The study was conducted to determine the quality of vinegar made from coconut water and fresh toddy added with mother liquor. It was conducted in a Completely Randomized Design with 13 treatments replicated three times. The treatment tested were comprised of Coco water + Toddy + Mother Liquor at varying ratios such as: A-150+50+50, B-125+75+50, C-100+100+50, D-75+125+50, E-50+150+50, F - 75+125+50, G - 100+100+50, H - 125+75+50, I - 50+50+150, J - 50+75+125, K - 50+100+100, L - 50+125+75, and M - 50+150+50. Coconut water was taken from 11 to 12-month-old mature nuts while toddy used were harvested within the day of combining the composition of the treatments. On the other hand, mother liquor was harvested from mature pure coconut vinegar of the same lot. The result of the study showed that Coconut water can be utilized as a component of naturally fermented vinegar up to 30% only. The greater the amount of toddy present in the coconut water, toddy, and mother liquor mixture, the lower the pH of the vinegar and the better the quality. At least 20% mother liquor can be added to the coconut water, toddy, and mother liquor to produce good-quality vinegar. Vinegar from coconut water, toddy, and mother liquor mixture is usable up to 5th week of fermentation, after which the quality declines. Hence, coconut water combined with toddy and mother liquor produced an acceptable quality of vinegar.

Keywords: Coconut water, mother liquor, natural vinegar, toddy

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Introduction

Coconut is a major crop in the Philippine agricultural sector (Ranada, 2014). As a high-performing agricultural product in the Philippine economy, coconut exportation is a predictor of the general economic activity of the country (FAO, 2016).

In order to increase coconut production and export raw and processed coconut products, scientists and policy-makers require a comprehensive assessment of the current state of coconut production and coconut supply chains in the Philippines and the development of potential coconut products (Moreno et al. 2020).

One coconut product yet to gain greater demand in the industry is coconut vinegar (NDTV Food, 2016). Coconut is a natural product obtained from the natural fermentation process, with no preservatives or chemicals added (Yeap, 2017).

Vinegar has been used as a food and medicinal tonic for centuries. It contains essential nutrients for healthy digestion, metabolism, and production. All vinegar, specifically inorganic types such as apple cider vinegar, is less filtered and processed and is beneficial for heart, blood vessels, nerve, and muscle health (Tang, 2019).

Organic coconut vinegar has a cloudy, white appearance and a slightly milder taste than apple cider vinegar (Petre, 2018). Natural vinegar is a better food additive than synthetic vinegar as it carries essential amino acids from its fruit source (Johnston 2016).

The utilization of coconut water has evolved over the years owing to its unique chemical composition of sugars, vitamins, amino acids, and enzymes (Yong, 2009).

Though coconut water is available in plenty in most coconut growing areas in the country, there has yet to be any industrial application for the product. Coconut water is now a waste product of the copra and desiccated coconut industries. Hence, this study implores the possible use of coconut water as a component in vinegar production with the use of mother liquor as a vinegar enhancer.

Materials and Methods

The study was conducted in a Completely Randomized Design with 13 treatments replicated three times. The treatment tested were comprised of Coco water + Toddy + Mother Liquor at varying ratios such as: A-150+50+50, B-125+75+50, C-100+100+50, D-75+125+50, E-50+150+50, F - 75+125+50, G - 100+100+50, H - 125+75+50, I - 50+50+150, J - 50+75+125, K - 50+100+100, L - 50+125+75, and M - 50+150+50.

Coconut water was taken from 11 to 12-month-old mature nuts while toddy used were harvested within the day of combining the composition of the treatments. Mother liquor, on the other hand, was harvested from mature pure coconut vinegar

of the same lot. Data gathered included pH on a weekly basis and changes in odor and taste. pH was analyzed using the Analysis of Variance and interpreted at 5% significance levels, while differences among treatment means were determined using DMRT.

Results and Discussion

pH on the Different Mixtures

The Analysis of Variance in the pH of the different mixtures revealed significant results from the 1st week up to the 5th week of the study (Table 1). This implied that the different proportions of coconut water, toddy, and mother liquor affected the pH of the mixtures.

Initially, it can be noted that those treatments (Treatments A to H) having a greater amount of coconut water showed higher pH except for Treatments A (150 ml coconut water + 50 ml toddy + 50 ml mother liquor) and H (125 ml coconut water + 75 ml toddy + 50 ml mother liquor). While those treatments (Treatments I to M) with lower amounts of coconut water displayed lower pH except for Treatment J (50 ml coconut water + 75 ml toddy + 125 ml mother liquor), as shown in Figure 1.

On the 5th week, the different treatments registered lower pH than the previous weeks except for Treatment H (125 ml coconut water + 75 ml toddy + 50 ml mother liquor). Treatment E (50 ml coconut water + 150 ml toddy + 50 ml mother liquor) manifested the lowest pH in the 5th week (Figure 1).

In the 6th week, the treatments' pH increased (Figure 1). The increased pH of the different mixture combinations implied that the different treatment combinations might be used in making vinegar. However, it can only be used or stored for five weeks, after which its potent as vinegar is lost. This is also true for synthetic chemicals or vinegar mixed with citric acid.

Among the different treatments tested, continually decreasing pH was noted on Treatments D, E, and M. Among the three, Treatment E gave the lowest pH (Figure 1).

Figure 1. Changes in the pH of the different mixtures in vinegar production.

Treatment	TABLE OF MEANS PER WEEK					
	WEEK 1 *	WEEK 2 *	WEEK 3 *	WEEK 4 *	WEEK 5 *	WEEK 6 *
A	3.46 H	3.54 A	3.56 A	3.52 A	3.48 A	3.85 A
B	3.65 C	3.41 B	3.44 B	3.36 DE	3.37 BC	3.56 AB
C	3.63 D	3.35 BCD	3.38 BCD	3.43 B	3.30 CDE	3.62 AB
D	3.55 E	3.39 BC	3.34 CDEF	3.46 DE	3.28 DE	3.47 AB
E	3.51 F	3.37 BCD	3.31 DEF	3.31 EFG	3.21 E	3.34 B
F	3.67 B	3.36 BCD	3.39 BCD	3.37 CD	3.33 CD	3.59 AB
G	3.70 A	3.41 B	3.40 BC	3.44 B	3.33 CD	3.30 B
H	3.45 H	3.28 CD	3.46 B	3.42 BC	3.43 AB	3.63 AB
I	3.52 F	3.27 D	3.29 EF	3.29 G	3.26 DE	3.45 B
J	3.56 E	3.28 CD	3.26 F	3.32 DEFG	3.22 E	3.57 AB
K	3.43 I	3.33 BCD	3.28 EF	3.30 FG	3.26 DE	3.44 B
L	3.48 G	3.32 BCD	3.33 CDEF	3.32 DEFG	3.25 DE	3.37 B
M	3.46 H	3.36 BCD	3.36 CDE	3.35 DEF	3.31 CD	3.27 B

The odor of the Different Mixtures

Change in odor was noted on the 5th week of observation and progressed to the 6th week. No pleasant odor was recorded on Treatments A, B, C, G, H, I, and J. These different treatments were added with a lesser amount of toddy. On the other hand, treatments added with a greater amount of toddy (100 ml to 150 ml) of toddy manifested acceptable odor up to the 6th week of observation.

Implications of the results

The results obtained from the study proved that coconut water can be added to the making of vinegar. The proportion must be at most 30% of the total volume. Much more, mother liquor can be added instead of synthetic fermentation enhancers like citric acid. Adding mother liquor is a healthier option for organic practitioners and health-conscious individuals. The resulting product from the fermentation process using mother liquor must be utilized within five weeks, or its vinegar flavor and souring potentials likewise decline.

Much more, using coconut water as a component for vinegar production is a form of by-product utilization in coconut that may increase the farmer's income.

Table 1. pH level of vinegar produced from the different proportions of coconut water, toddy, and mother liquor per week.

TABLE OF MEANS PER WEEK						
Treatment	WEEK 1 *	WEEK 2 *	WEEK 3 *	WEEK 4 *	WEEK 5 *	WEEK 6 *
A	3.46 H	3.54 A	3.56 A	3.52 A	3.48 A	3.85 A
B	3.65 C	3.41 B	3.44 B	3.36 DE	3.37 BC	3.56 AB
C	3.63 D	3.35 BCD	3.38 BCD	3.43 B	3.30 CDE	3.62 AB
D	3.55 E	3.39 BC	3.34 CDEF	3.46 DE	3.28 DE	3.47 AB
E	3.51 F	3.37 BCD	3.31 DEF	3.31 EFG	3.21 E	3.34 B
F	3.67 B	3.36 BCD	3.39 BCD	3.37 CD	3.33 CD	3.59 AB
G	3.70 A	3.41 B	3.40 BC	3.44 B	3.33 CD	3.30 B
H	3.45 H	3.28 CD	3.46 B	3.42 BC	3.43 AB	3.63 AB
I	3.52 F	3.27 D	3.29 EF	3.29 G	3.26 DE	3.45 B
J	3.56 E	3.28 CD	3.26 F	3.32 DEFG	3.22 E	3.57 AB
K	3.43 I	3.33 BCD	3.28 EF	3.30 FG	3.26 DE	3.44 B
L	3.48 G	3.32 BCD	3.33 CDEF	3.32 DEFG	3.25 DE	3.37 B
M	3.46 H	3.36 BCD	3.36 CDE	3.35 DEF	3.31 CD	3.27 B

Conclusions

Based on the results of the study, the following conclusions are forwarded: Coconut water combined with toddy and mother liquor produced acceptable-quality of vinegar. Coconut water can be utilized as a component of naturally fermented vinegar up to 30% only. The greater the amount of toddy present in the coconut water, toddy, and mother liquor mixture, the lower the pH of the vinegar and the better the quality. At least 20% mother liquor can be added to the coconut water, toddy, and mother liquor to produce good-quality vinegar. Vinegar from coconut water, toddy, and mother

liquor mixture is usable up to 5th week of fermentation, after which the quality declines.

Recommendations

Based on the results of the study, the following recommendations are forwarded: Use 30% coconut water combined with toddy and 20% mother liquor to produce naturally fermented vinegar. Used and stored vinegar made from coconut water, toddy, and mother liquor for five weeks only for maximum souring potential. Conduct similar studies with the following modifications: a. pasteurize the coconut water before combining it with toddy and mother liquor; and b. use different ages of mother liquor.

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